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du Treil, Lundin & Rackley, Inc.
A Subsidiary of A. D. Ring, P.C.

October 7, 1993

Office of the Secretary
Federal Communications Commission
Washington, D.C. 20554

Re: MM Docket No. 93-226

Gentlemen:

Enclosed is an original and nine copies of the comments of this firm In the Matter of Revision of 47 C.F.R. 73.208. Reference Points and Distance Computations, MM Docket No. 93-226.

Very truly yours,

Louis R. du Treil

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Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C. 20554

In the Matter of	)	
	)	
Revision of 47 CFR 73.208	)	MM Docket No. 93-226
Reference Points and Distance	)	
Calculations	)	

COMMENTS OF DU TREIL, LUNDIN & RACKLEY, INC.
SARASOTA, FLORIDA

The carpenter selected a fine oak board; before cutting he paused, marked it very carefully with a ruler, scribed the line, and then checked the line again with a micrometer. He rechecked his calculations and began cutting the board with an axe.
(An Engineering Professor's Example Regarding Accuracy)

The Commission proposes in this Docket to tighten the way separations are rounded so as to provide for increased accuracy and to prevent additional interference. The Commission's action is misguided since, just as a chain is as strong as it's weakest link, as there are other much more important considerations.

The circumference of a circle is described as the factor "Pi" multiplied by the diameter of a circle. "Pi" is a very interesting number which has been calculated to hundreds of decimal places and does not repeat itself. Even knowing the ultra extreme accuracy of "Pi", the actual calculation of the circumference of a circle is dependent on the accuracy of the diameter measurement. The diameter measurement is the weak link in this equation. If the diameter can be measured to one-tenth of an inch, then the circumference accuracy is no better than one-tenth of an inch. There is no value in adding hundreds of digits beyond the decimal point as the resultant describes nothing more than a circumference having accuracy of

one tenth inch.

The Commission's proposal specifies distance measurement accuracy to 10 meters (32 feet). This degree of accuracy cannot be supported as there are other links in the separation chain which are substantially "weaker". Consider the FCC propagation curves employed for determining coverage and interference for FM broadcast stations (47 CFR 73.333). These curves have an accuracy of plus or minus 9.0 dB[1]. This means in the case of a maximum facility Class A FM station (6 kW, 100 m) that the distance to the 60 dBu contour meets the accuracy of the propagation curves if it falls between 17,300 meters and 44,400 meters, a difference of 27,100 meters. Likewise, the co-channel interference contour (40 dBu) falling between 56,900 meters and 129,600 meters (a difference of 72,700 meters) meets the accuracy of the propagation curves.

To digress for a moment, it should be realized that when the initial table of FM allotments and the separation table were adopted by the Commission, it recognized and appreciated the degree of accuracy in which it was dealing and rounded the calculated separations to the nearest 5 miles. When the FM rules were changed from English to metric format[2], a tightening of separations occurred as a kilometer is approximately 60 per cent of the distance in one mile. This firm remembers quite well that computed or measured mileage separation rounded to the nearest mile was quite acceptable prior to the use of computers.

One further digression - computers. These wonderful instruments give engineers and scientists the ability to make

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[1] FCC Report No. R-6602, Development of VHF and UHF Propagation Curves for TV and FM Broadcasting, Jack Damelin, et al, September 7, 1966.

[2] By Order of the Commission, released May 22, 1985.

thousands of calculations of difficult mathematical problems and to fine-tune designs by elimination of previously used "approximations" which made hand calculation easier and more manageable. Although some minor accuracy improvement may have resulted from computer usage, the usual computer print out showing "umpteen" digits beyond the decimal point usually has no practical meaning, but gives an illusion of great accuracy. Just because the computer has the capability of great accuracy, its accuracy is dictated by the input.

But, back to the FCC 10 meter rounding suggested limit. In addition to the variability of contour distance when using the propagation curves, these following additional much less important items also affect the accuracy of the separation distance.

Geographic Coordinates. The geographic coordinates for a particular tower location are generally determined by marking the location on a map then graphically measuring the coordinates. They are rounded to the nearest second. The site "window" with this rounding can result in error of about 30 meters. Due to the usual method of locating a site and calculating coordinates, rounding to the nearest second makes good sense.

Coordinates Conversion. The FCC recently decided to maintain its geographic coordinates based on North American Datum from 1927 (NAD 27) rather than adopting coordinates from NAD 83. The Federal Aviation Administration (FAA), on the other hand, adopted the NAD 83 coordinates[/3] as it was concerned as to the accuracy of locations of objects which might pose a hazard to air navigation. The NAD 83 coordinates are more accurate that NAD 27 due to a more precise measurement

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/3 As Ordered by Public Law 101-508

of the Earth's ellipsoidal parameters[14], which improved the weak link in this calculation. The maximum difference in location between these data is about 345 feet (105 meters)[15].

FM Antennas on Towers. There are situations where FM antennas are mounted on candelabra or cross-arm structures on top of tall towers or side-mounted on towers having a large cross section. As the center of the tower is used to determine coordinates, some antennas could easily be 30 feet (9 meters) off center, affecting the separation computation by plus or minus 30 feet (18 meters).

In summation, the accuracy of separation and contour calculation depends on these factors:

* Propagation Curves
* Geographic Coordinates
* NAD Conversion
* Mounting Location

which are but "links" in the chain. The Commission proposes a new "link" of 10 meters while the most uncertain of the existing "links" is propagation prediction of around 72,700 meters. With this latter figure in mind, does it make any sense to adopt the 10 meter rounding proposal?

dLR and it's parent firm have been involved in all facets of communication engineering for over 50 years, and suggests that if the Commission is truly interested in improving allocation methods and especially in controlling interference, that it move toward improving the weakest link in the chain - the propagation curves, rather than nibbling at the edges. There are sophisticated techniques, such as "Technical Note 101", which greatly enhance the predicted accuracy of

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[14] As the measurement techniques get more sophisticated, the overall accuracy of computation is improved.

[15] In Alaska and Hawaii the difference can be as great as 1200 feet (366 meters).

coverage and interference. These programs are generally available for personal computers allowing great improvement in propagation prediction.

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